The Island of the Sun: Spatial Aspect of Solstices in Early Greek Thought

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THE SOLSTICES are the defining moments in the annual solar motion. The phenomenon, representing the maximum solar distance from the equator (i.e., declination), is manifested both on the temporal and on the spatial level. With regard to the former, it entails recognition of the longest and the shortest daytimes of the year, with the length increasing from winter to summer solstice and decreasing during the remaining half of the year. This phenomenon is more pronounced with an increase in latitude, culminating in a 24-hour solstice daytime or night at ca. 66°.

However, it is the spatial level that is discussed in this paper. The problem is approached by an analysis of several *heliotropia*, devices for marking or measuring solar turnings, and the Greek notion of solar turnings themselves, which is in its turn studied through discussion of the occurrences of the phrase τροπαὶ (ἡελίοιο) and its variants in traditional and in scientific texts.[1] Both the name of the marking-device and the phrase with its

[1] Both types of texts belong to a common Greek ethnographic context, which embraces a wide range of cultural phenomena. For the notion of ethnographic context see especially the works of M. Detienne: "The Myth of 'Honeyed Orpheus'," in R. L. Gordon (ed.), *Myth, Religion and Society. Structuralist Essays by M. Detienne, L. Gernet, J.-P. Vernant and P. Vidal-Naquet* (Cambridge 1981) 95–109, at 98–99, 106–109; *The Gardens of Adonis. Spices in Greek Mythology* (Baltimore 1994) 130–131, 143; *Comparative Anthropology of Ancient Greece* (Washington 2009) 36–37. For the importance of ethnographic context in the study of ancient science see G. E. R. Lloyd, "Methods and Problems in the History of Ancient Science. The Greek Case," *Isis* 83 (1992) 564–577, at 567.

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variants are constructed out of identical constitutive elements, "sun" + a word designating "turning" derived from the root τροπ-. Although certain nuances in the exact meaning of specific occurrences of the variants of the phrase can be gauged by a careful analysis, nearly all seem to refer specifically to the annual turnings of the sun, with a consistent emphasis on their manifestations on the spatial level.

With respect to this level, the most easily recognizable manifestations of the solstices are the extreme points of solar risings and settings on the horizon. These were used to define the sections of the *oikoumene* at least from the time of Ephoros,[2] who is our first extant source that systemizes the concept of four solstitial horizon points into a coherent structure.[3] Additionally, the spatial aspect of the solstices can be perceived as a projection of the maximum solar declination onto the earth's surface, in terms of a spherical earth corresponding to the latitude of the fixed arctic circle, but also applicable, if less precisely and more arbitrarily, on a flat earth, in which case it corresponds to a latitude determined by the solstice azimuths as observed from Greece.[4] This cosmological location was known

[2] *FGrHist* 70 F 30a (Strab. 1.2.28); 30b (Cosm. Indic. *Topogr.* 2.79, cf. 80, with an accompanying diagram illustrating his concept, for which see A. Ballabriga, *Le Soleil et le Tartare: L'Image mythique du monde en Grèce archaïque* [Paris 1986] 148; G. Aujac, "The Foundations of Theoretical Cartography in Archaic and Classical Greece," in J. B. Harley and D. Woodward [eds.], *The History of Cartography* I [Chicago 1987] 130–147, at 144 fig. 8.12); 30c ([Scymn.] 167–182 [*GGM* I 201–202]); Solin. 30.14; Eust. *Od.* 1.23 (I 11 Stallbaum). A similar diagram, representing a rectangular earth whose corners are defined by curves illustrating the diurnal courses of the sun on both solstices, i.e. by the points of its summer and winter sunrises and sunsets, occasionally appears in manuscripts from the Carolingian period onwards (for examples see B. Obrist, "Wind Diagrams and Medieval Cosmology," *Speculum* 72 [1997] 33–84, at 57–58 with n.101, 59 figs. 16–17).

[3] W. A. Heidel, *The Frame of the Ancient Greek Maps* (New York 1937) 16–20, 30, 45–46; O. A. W. Dilke, *Greek and Roman Maps* (Ithaca 1985) 27; Ballabriga, *Le Soleil* 147–149; D. W. Roller, *Ancient Geography. The Discovery of the World in Classical Greece and Rome* (London/New York 2015) 82.

[4] Although it is impossible to derive a precise latitude from the azimuths,

to the Greeks from Pytheas' time onwards as Thoule, where the summer tropic and the always-visible circle become one.[5] Indeed, it could be claimed that the sun turns at (the latitude of) that island.[6] This study thus follows the Greek understanding of solstices or solar turnings in the context of successive prevailing cosmological frameworks, recognizing the decisive role of these frameworks in understanding the various authors' references to this phenomenon. The discussion of two complementary spatial aspects of solstices as understood by the Greeks will be accompanied by a special emphasis on the interpretation of the solar turnings mentioned in the *Odyssey*.

The Odyssey and other early occurrences of the term τροπαί

The first occurrence of the phrase "solar turnings" appears precisely in the *Odyssey*. Here Homer describes the island of Syrie above Ortygia, and places there the τροπαὶ ἠελίοιο

it seems safe to presume that the later 'standard' latitude for the limit of the *oikoumene* (54°) is closely connected to this concept; cf. T. Bilić, "Crates of Mallos and Pytheas of Massalia: Examples of Homeric Exegesis in Terms of Mathematical Geography," *TAPA* 142 (2012) 295–328, at 304–306, 312–313. Comparably, for Strabo (1.1.6) the arctic circle (presumably the always-visible circle for the standard latitude of Greece, i.e. Rhodes, at 36°) touches (ἁπτόμενον) the earth at the northernmost limit of the *oikoumene*. Incidentally, Ptolemy took 30° as the angular distance of solstitial rising and setting points from due east/west, which is the approximate value of the solstitial angular distance for the latitude of 36° (J. L. Berggren and A. Jones, *Ptolemy's Geography* [Princeton 2000] 15); this means that the summer solstice azimuths correspond to the latitude of 66°, i.e. approximately the latitude of the geographical arctic circle. However, the same comment also applies to this derivation of latitude from azimuths.

[5] Pyth. fr.6 Roseman = Eratosth. fr.34 Roller. Cf. Krates fr.14 Mette = T 27 Roseman, also Cleom. *De motu circ.* 1.4.222 Todd; see also Pyth. T 10 Roseman and Krates fr.37b (H. J. Mette, *Sphairopoïia: Untersuchungen zur Kosmologie des Krates von Pergamon* [Munich 1936] 268.5–7).

[6] Dionys. Per. 584–586 (*GGM* II 141), cf. Fest. Avien. *Descr orb.terr.* 764–767 (*GGM* II 184); Eust. Dionys. Per. 581 (*GGM* II 329.33–37); Isid. *Etym.* 14.6.4 (the Sun "makes" the summer solstice at Thoule), also cited by the anonymous *Eulogium Historiarum* 4.156 (II 113 Haydon).

(15.404). This expression almost certainly, in some way, designates the solstices.[7] Thus in Hesiod ἠελίοιο τροπαί (*Op.* 479) and τροπαὶ ἠελίοιο (564, 663) bear the meaning of "summer" or "winter solstice," respectively,[8] and that meaning remained more or less stable during antiquity.[9] Other early occurrences of the word τροπαί in the meaning of "solstices" date from the seventh and sixth centuries.[10] Both Hesiod and Alkman used the term in a temporal (seasonal) sense. Kleostratos, on the other hand, is said to have observed the solstices from Tenedos with Mount Ida as a natural foresight, thus referring to the extreme horizon positions of the sun.[11] The testimonies on Thales

[7] J. O. Thomson, *History of Ancient Geography* (Cambridge 1948) 37 with n.1; C. H. Kahn, "On Early Greek Astronomy," *JHS* 90 (1970) 99–116, at 113 n.50, and *The Art and Thought of Heraclitus* (Cambridge 1979) 109, 140, 313 n.133; G. Vlastos, *Plato's Universe*[2] (Las Vegas 2005 [[1]1975]) 34 n.21 (probably); H. S. Schibli, *Pherekydes of Syros* (Oxford 1990) 5. *Pace* D. R. Dicks, "Solstices, Equinoxes, and the Presocratics," *JHS* 86 (1966) 26–40, at 31 (cautiously), and *Early Greek Astronomy to Aristotle* (Ithaca 1970) 32–33 (resolutely).

[8] M. P. Nilsson, *Primitive Time-reckoning* (Lund 1920) 316; A. Pannekoek, *A History of Astronomy* (London 1961) 95–96; Dicks, *JHS* 86 (1966) 31, and *Early Greek Astronomy* 34–35, 37; Kahn, *JHS* 90 (1970) 113; A. Ballabriga, *Les fictions d'Homère. L'invention mythologique et cosmographique dans l'Odyssée* (Paris 1998) 107; J. Evans, *The History and Practice of Ancient Astronomy* (New York 1998) 4–5, 56; Vlastos, *Plato's Universe* 34 n.21.

[9] T.-H. Martin, "Comment Homère s'orientait," *Mémoires de l'Académie des Inscriptions et Belles-Lettres* 19.2 (1879) 1–28, strongly argued that the phrase was *always* used as a technical term for "solstice" (cited by T. L. Heath, *Aristarchus of Samos, the Ancient Copernicus* [Oxford 1913] 10 n.1).

[10] Alcm. 17.5 *PMG*; Cleostr. 6 A 1 D.-K.; Thales 11 A 1, 17 (on the authority of Eudemus fr.144-145 Wehrli), 3 D.-K.; Anaximand. 12 A 1, 2, 4, 27 D.-K. (with Arist. *Mete.* 355a24–26 and Alex. *In Mete.* 73.19–22, not cited by D.-K. with A 27).

[11] J. K. Fotheringham, "Cleostratus," *JHS* 39 (1919) 164–184, at 168–169; E. J. Webb, "Cleostratus Redivivus," *JHS* 41 (1921) 70–85, at 71; cf. Pannekoek, *A History of Astronomy* 107; A. C. Bowen and B. R. Goldstein, "Meton of Athens and Astronomy in the Late Fifth Century B.C.," in E. Leichty et al. (eds.), *A Scientific Humanist: Studies in Memory of Abracham Sachs* (Philadelphia 1988) 39–81, at 80. The same source (Theoph. *Sign.* 4) attrib-

are either non-committal (1, 3) or temporal (17),[12] while in Anaximander the references are certainly spatial, denoting the position of the sun on the horizon or at the meridian (1, 2, 4) or the sun's extreme declination in general (27).[13] With regard to the first notion, the fact that Anaximander used a gnomon for marking (from σημαίνω) or distinguishing (διάγνωσις) the solstices (12 A 1, 4) most probably points to the observance of noon shadow lengths.[14] Alternatively, it could refer to the observance of sunrise and sunset points, which was utilized for creating the map of the *oikoumene* defined by these azimuths.[15] In any case, this group of testimonies refers to the spatial aspect of solstices. It is entirely possible that Anaximander's map (as well as Hekataios', which was derived directly from it) was already determined by sunrise and sunset solstice points,[16]

uted the observance of solstices from Methymna with Mount Lepetymnos as a foresight to a certain Matriketas, perhaps also an early astronomer. In both cases only the winter solstice could have been observed (cf. A. Rehm, *Parapegmastudien. Mit einem Anhang: Euktemon und das Buch De signis* [Munich 1941] 138–139 n.5). Rehm (135–137) believes that neither Matriketas nor Kleostratos observed the solstices, but rather the weather signs.

[12] Cf. A. C. Bowen, "Eudemus' History of Early Greek Astronomy: Two Hypotheses," in I. Bodnár and W. W. Fortenbaugh (eds.), *Eudemus of Rhodes* (New Brunswick 2002) 307–322, at 311 n.10.

[13] It makes no difference if he understood—as he did—the τροπαί with reference to a flat earth (D. L. Couprie, *Heaven and Earth in Ancient Greek Cosmology. From Thales to Heraclides Ponticus* [New York 2011] 140–141).

[14] Heidel, *The Frame* 57–58; S. L. Gibbs, *Greek and Roman Sundials* (New Haven 1976) 6; R. Hahn, *Anaximander and the Architects: the Contributions of Egyptian and Greek Architectural Technologies to the Origins of Greek Philosophy* (Albany 2001) 207, 209 fig. 4.13; Couprie, *Heaven and Earth* 31, 32 fig. 13, with 34–35 and fig. 2.16 (diurnal curves).

[15] Heidel, *The Frame* 57–58; Hahn, *Anaximander* 8, 38, 44, 201, 205–206 with fig. 4.12 on 207, 208; D. L. Couprie, R. Hahn, and G. Naddaf, *Anaximander in Context* (Albany 2003) 52, 194–195; G. Naddaf, *The Greek Concept of Nature* (Albany 2005) 109; Couprie, *Heaven and Earth* 80 with fig. 6.1, 84.

[16] Heidel, *The Frame* 17–20, 22, 33–34, 42, 47–48, 51, 53–54, 57, 133; Thomson, *History* 97–98; Ballabriga, *Le Soleil* 147–149; Hahn, *Anaximander* 8, 201, 205–206, 285 n.140; Naddaf, *Greek Concept of Nature* 109–110; Couprie,

Ephoros' parallelogram being only a later rendition of the same concept.[17] In this case, Anaximander's concept of the τροπαί would definitely encompass the notion of the extreme horizon positions of the sun. Moreover, this notion would be of decisive importance for the making of 'Ionian' maps, which would in this way be closely associated with the coordinate system exemplified in the position of Homer's Syrie, when the latter is understood as associated with the horizon position of the sun at solstices.[18] Yet the making of the map probably required an additional step, the recognition of solstitial 'latitudes' derived from solstitial azimuths.

Later, the explicit observance of the points on the horizon where the solstices occur (τόποι τῶν τροπέων … ὁ ἥλιος ποιούμενος) is attested for Eudoxos,[19] while the observation of the position of sunrises on the local horizon was recommended to a physician upon arriving in a city he is unfamiliar with by the author of the Hippocratic treatise *Airs, Waters, Places*.[20]

On the other hand, Xenophon's description of the sun's annual movement, with a strong emphasis on its turnings (using the verbs τρέπω, ἀποτρέπω, and ἀναστρέφω), probably refers to the sun's approach in general (he describes its movement in latitude with πρόσειμι, προσχωρέω, and ἄπειμι), rather than specifically to the sunrise/sunset positions on the horizon (*Mem.*

Heaven and Earth 80–82, 84; Couprie, Hahn, and Naddaf, *Anaximander* 52–53, 195–197.

[17] Heidel, *The Frame* 17–20, 33–34, 42, 47–48; Thomson, *History* 97–98; Ballabriga, *Le Soleil* 147–149; Naddaf, *Greek Concept of Nature* 109–110; Couprie, Hahn, and Naddaf, *Anaximander* 52–53.

[18] Heidel, *The Frame* 59.

[19] Fr.63b Lasserre (Hipparch. 1.9.2); cf. fr.63a (Hipparch. 1.9.1 = Attalus Rhod. fr.20 Maass); E. Dekker, *Illustrating the Phaenomena. Celestial Cartography in Antiquity and the Middle Ages* (Oxford 2013) 9.

[20] Hippocr. *Aër.* 1. In the same treatise (12) Asia (Minor) is said to lie "midway between the sunrises," i.e. between the sunrises on the solstices, thus emphasizing the importance of these positions in Hippocratic thought.

4.3.8).[21] Similarly, already Hesiod claimed that the sun during winter goes to the territory of the black men (using the phrase ἐπὶ … στρωφᾶται, "turns on"),[22] while Herodotos believed that it is driven to farther Libya (2.24.1, 25.1, 26.2),[23] and in the Hippocratic *Airs, Waters, Places* (19) the sun is described as coming nearest to Scythia when it reaches its summer turning-point.[24] This is how the sun and its turnings can "be" at some geographical position or latitude. The importance of this notion, already current in the archaic period, will become clear below in the discussion of the location of Syrie, which is decidedly associated precisely with the spatial aspect of solstices.

The heliotropion at Syracuse

Several analogue devices that were used to mark or measure the solstices are mentioned in ancient literature under the name *heliotropion*. One was erected by Dionysios the tyrant of Syracuse; Dion's soothsayers feared that the speech he had given standing on it could provoke an ominous change (τροπή) of his fortune (Plut. *Dion* 29.3, 5). Plutarch's phrase can be rendered as a device for marking the turnings of the sun, but it could also refer to a simple sundial.[25] The Syracusan *heliotropion* is further mentioned casually by Moschion,[26] specifying that it

[21] Cf. Plut. *Quaest.Rom.* 19 (268D), where the sun at the winter turning-point turns (ἐπιστρέφω) and returns backwards towards us, and Gemin. 5.5, 8, where it similarly turns (τρέπω) at solstices.

[22] *Op*. 527–528; Ballabriga, *Le Soleil* 20, and *Les fictions d'Homère* 108. Cf. Dionys. Per. 586 (*GGM* II 141).

[23] Cf. Arist.(?) *De inundatione Nili BNJ* 646 F 1.8, 3; Agathar. *FGrHist* 86 F 19 (Diod. 1.38.8; cf. Theoph. Sim. *Hist*. 7.17.15); Anon. Flor. *De Nilo FGrHist* 647 F 1.7 (Ath. *Epit.* 87F [I 132.5–6 Meineke]), cf. 647 F 2.5 = Aët. 4.1.5 = [Plut.] *Placit*. 4.1 (898A); Ael. Aristid. 36.41 Keil, cf. 60.

[24] Cf. Hippocr. *De victu* 2.38 (the north wind comes from the region which the sun does not approach).

[25] O. Wenskus, *Astronomische Zeitangaben von Homer bis Theophrast* (Stuttgart 1990) 39–40.

[26] Mosch. *FGrHist* 575 F 1 (Ath. 207E–F). For the identity of these two devices see Wenskus, *Astronomische Zeitangaben* 39–40.

was located in Achradina, that is, in Syracuse proper (not on the islet Ortygia) (cf. Plut. *Dion* 29.2–3), and that it had a πόλος, suggesting a sundial. I will discuss below the hypothetical connection of the Syracusan *heliotropion* with the *Odyssey* passage describing the turnings. In general, it remains unclear whether (1) there is any connection between the collocation of Syracuse/Ortygia on Sicily with Homer's Syrie "above" Ortygia and (2) whether the Syracusan *heliotropion* should in any way be associated to either of these complexes.

Syros

Another such analogue device is Pherekydes' *heliotropion* on the island of Syros (fr.15 Schibli), which was eventually introduced into the discussion of Homer's "turnings." A scholiast on Homer describes with respect to "the turnings of the sun" at Syrie a "cave of the sun" on Kykladic Syros "through which they mark (σημειοῦνται) the sun's turnings."[27] It has been argued that the orientation of the cave on Syros was such that it allowed the recognition of the day of the solstice.[28] But Pherekydes' device, on the other hand, is believed by Bowen and Goldstein to have been different from the cave, and understood as an instrument oriented upon the sunrise points on the days of the solstice.[29] This seems contrary to the interpretation given by another scholiast, who associated "the turnings of the sun" and the cave on (most probably) Syros with the invention of the *heliotropion*.[30] It remains unclear what is the nature of the con-

[27] Schol. QV *Od.* 15.404 (II 617 Dindorf). For the association of the cave with the turnings of the sun see further schol. D *Od.* 15.404 (N. Ernst, *Die D-Scholien zur Odyssee* [diss. Cologne 2006] 312) and Eust. *Od.* 15.404 (II 105 Stallbaum).

[28] See Bowen and Goldstein, in *A Scientific Humanist* 73.

[29] Bowen and Goldstein, in *A Scientific Humanist* 73 n.169. G. S. Kirk, J. E. Raven, and M. Schofield, *The Presocratic Philosophers*[2] (Cambridge 1983) 54–55, on the other hand, believe that the cave is the *heliotropion* of fr.15 Schibli, but that this should not be attributed to Pherekydes. They interpret it as a device for marking the turnings of the sun (cf. Schibli, *Pherekydes* 5).

[30] Schol. D (Z[rec]M⌝) *Od.* 15.404 (Ernst, *Die D-Scholien* 312). The scholiast's

nection of (1) Homeric Syrie with its "turnings" to the cave on Syros and (2) of either of these to Pherekydes' instrument.

Nevertheless, the identification of Homeric Syrie with Kykladic Syros was popular both in antiquity[31] and in modern times.[32] However, the fact that Homer mentions how Artemis slew Orion on Ortygia (*Od.* 5.123–124), while another version of the myth says he was killed on Delos,[33] which is often used as an argument in support of this thesis, does not immediately identify Homer's Ortygia with Delos nor does it identify Syrie with Kykladic Syros; it only confirms that later authors identified the two pairs of locations.[34] In any case, it will be shown below that the Ortygia/Syrie complex can be interpreted as a mythic or cosmological location of "the island of the solstice," which makes these identifications secondary.

The heliotropion at Athens

Meton's instrument at Athens is another example of a *helio-*

explanation is garbled: he first repeats "the cave of the sun" theory, then he claims that the device of that name was invented there (apparently identifying it with the cave) and, finally, remarks that it was used to observe the winter solstice and equinox, apparently with reference to solar azimuths (since the equinox is defined by the sun's position "in the middle").

[31] Pherec. 7 A 3 D.-K. = fr.3 Schibli; Andron of Ephesos fr.5 (*FHG* II 347), according to Schibli, *Pherekydes* 5 n.11; schol. BHQ *Od.* 15.403 (II 617 Dindorf); schol. D *Od.* 15.403 (Ernst, *Die D-Scholien* 312); Eust. Dionys. Per. 525 (*GGM* II 319), Eust. *Od.* 15.403 (II 105 Stallbaum).

[32] K. O. Müller, *Geschichten hellenischer Stämme und Städte* I *Orchomenos und die Minyer* (Breslau 1820) 326 with n.6, and *Die Dorier* I (Breslau 1824) 377; T.-H. Martin, "Astronomia," Dar.-Sag. I.1 (1892) 476a–504a, at 477a; U. von Wilamowitz-Moellendorff, "Pherekydes," *SBBerl* (1926) 125–146, at 125–126 (further cited in J. Schmidt, "Ortygia 4," *RE* 18 [1942] 1520–1526, at 1524.1–8; H. L. Lorimer, *Homer and the Monuments* [London 1950] 80–81; Wenskus, *Astronomische Zeitangaben* 39; Ballabriga, *Le Soleil* 17–19).

[33] [Apollod.] *Bibl.* 1.4.3. Perhaps also Euphor. fr.103 Powell (schol. PQT *Od.* 5.121 [I 255 Stallbaum]); J. Fontenrose, *The Delphic Oracle* (Berkeley 1981) 12, 158 n.2.

[34] The fact that Homer knew Delos by that name (*Od.* 6.162), on the other hand, does not conclusively prove he was unfamiliar with both names.

tropion.[35] Aelian does not mention the name of the instrument, but recounts how Meton erected stelae and marked (καταγράφω) on them "the turnings of the sun."[36] According to Philochoros it was located on the Pnyx hill in Athens,[37] from where both summer and winter solstice sunrise could have been observed over the summit of Mount Lykabettos and over the ridge of Mount Hymettos, respectively.[38] Theophrastos recounts how Meton's teacher Phaeinos observed the solstices precisely from (ἀπό) Mount Lykabettos,[39] but it is believed that he actually used it to establish an alignment with the solstice sunrise point,[40] utilizing the irregular profile of the mountain for determining the variations in sunrise azimuths.[41] It was precisely from the Pnyx that the solstice sunrise over Lykabettos was observed by Phaeinos.[42] Mount Hymettos, on the other hand, was certainly utilized for meteorological observations in antiquity.[43] It is possible that Meton's *heliotropion* was a device

[35] Aristophanes referred to it in his *Daitaleis* (fr.227: Achilles *Isag.Arat.* 28; E. Maass, *Aratea* [Berlin 1892] 12–13, and *Commentariorvm in Aratvm reliqviae* [Berlin 1898] 62; Jacoby, *ad FGrHist* 328 F 122 [I 497, II 402–403 n.11]; R. Hannah, *Time in Antiquity* [Oxford/New York 2009] 71). For Meton's observation of the summer solstice of 432 see further the Milesian *parapêgma*, fr.84.1–3 (D. Lehoux, "The Parapegma Fragments from Miletus," *ZPE* 152 [2005] 125–140, at 137, and *Astronomy, Weather, and Calendars in the Ancient World* [Cambridge 2007] 90 n.42, 479); Diod. 12.36.2; Ptol. *Alm*. 3.1 [205 Heiberg]; cf. O. Neugebauer, *A History of Ancient Mathematical Astronomy* II [Berlin 1975] 588, 617, 622; Bowen and Goldstein, in *A Scientific Humanist* 39, 64).

[36] *VH* 10.7; cf. Lehoux, *Astronomy, Weather, and Calendars* 96.

[37] *FGrHist* 328 F 122 (schol. Ar. *Av*. 997).

[38] Hannah, *Time in Antiquity* 5–9, 569.

[39] *Sign*. 4 = 6 A 1 D.-K. Rehm, *Parapegmastudien* 136, argues that the observations were made *of* the mountains, rather than *from* the mountains.

[40] Bowen and Goldstein, in *A Scientific Humanist* 80.

[41] Pannekoek, *A History of Astronomy* 107.

[42] Rehm, *Parapegmastudien* 135, 137–139.

[43] Theophr. *Sign*. 20, 24, 43. Also in Rehm's emendation of the text of Theoph. *Sign*. 4 (*Parapegmastudien* 139). Cf. an altar of Zeus Ὄμβριος on the

oriented upon the solstice sunrise that was partially illuminated by the sun on that day, thus establishing an alignment.[44] Thus Meton erected a device on a hill in Athens, perhaps a stele or a pillar. It was probably oriented upon the two nearby mountains, of which one was certainly observed for meteorological purposes in antiquity, and the other was used for solstice observations. This analogue instrument was most probably intended to mark the extreme solar horizon points. But it is unclear whether this observation, supported as it is in this case by ancient testimonies, can be projected onto other, less well documented *heliotropia*.

Itanos

Finally, a fourth-century B.C. inscription on a pillar from eastern Crete (Itanos) can be adduced in this context as a surviving part of an actual *heliotropion*.[45] On this pillar the "winter turnings" (τροπα[ὶ] χειμεριναί) are mentioned together with "the turnings of the sun" (ὁ ἥλιος τρέπεται).[46] It is believed that the pillar carrying the inscription served, together with a small offshore rock, as a winter solstice pointer, which is in fact more or less what the inscription itself says (lines 8–14).[47] Thus in Crete a part of an authentic *heliotropion*, a solstice marker from antiquity, is preserved.[48]

mountain (Paus. 1.33.2).

[44] Bowen and Goldstein, in *A Scientific Humanist* 73, 78, cf. 74, 76–77.

[45] Cf. Lorimer, *Homer* 81; Kirk, Raven, and Schofield, *The Presocratic Philosophers* 54–55; Wenskus, *Astronomische Zeitangaben* 39.

[46] *I.Cret.* III iv 11.4–6, 13–14 = *Syll.*[3] 1264 ("Itaniorum heliotropium").

[47] κ<α>τὰ τὴν χοιράδα τὴν μικρὰν καὶ τὴν στήλην ὁ ἥλιος τρέπεται; F. Halbherr, "Iscrizioni Cretesi," *Museo italiano di antichità classica* 3 (1890) 559–748, at 585–586; Lorimer, *Homer* 81; S. Isager and J. E. Skydsgaard, *Ancient Greek Agriculture: An Introduction* (London/New York 1992) 163.

[48] Cf. K. Kourouniotes and H. A. Thompson, "The Pnyx in Athens," *Hesperia* 1 (1932) 90–217, at 207–211, 216, who tentatively recognized the base of Meton's *heliotropion* on the Pnyx, for another possible example of material remains of a similar device.

Other occurrences of the variants of the phrase τροπαὶ ἡελίοιο

Several other attestations of the variants of the phrase are known from different sources; those of which anything can be said will be briefly mentioned here, with an attempt at gauging their precise denotations. Thus a month named Ἁλιοτρόπιος in Apollonia (*I.Magnesia* 45.2), Dyrrhachion (*I.Magnesia* 46.2–3 = *Syll.*[3] 560), and Dodona (*SGDI* 1338.5) was certainly associated with the summer solstice, and corresponded to Athenian Thargelion.[49] Furthermore, the months named Ποιτρόπιος (sixth month of the Delphian year, also intercalary; cf. the calendars from Amphissa, Chaleion, and Physkos)[50] and Ἐνδυσποιτρόπιος (tenth month of the Delphian year) were present in the calendar of Delphi and three West Lokrian cities.[51] At least the former of these could be associated with the winter solstice.[52]

Occasionally, *heliotropion* is simply a sundial (ὡρολογεῖον).[53] One such sundial is probably a *heliotropion* on Delos (*IG* XI.2 287A.117, B.145, of 250 B.C.). An exceptionally large number of sundials of different types have indeed been found on that island. On three specimens—spherical,[54] hemispherical,[55] and a horizontal plane sundial[56]—the solstices are labelled ΤΡΟΠΑΙ.

[49] C. Trümpy, *Untersuchungen zu den altgriechischen Monatsnamen und Monatsfolgen* (Heidelberg 1997) 156 with n.666, 158 with n.678, 163.

[50] Trümpy, *Untersuchungen* 204–206.

[51] Trümpy, *Untersuchungen* 212–213. Cf. the month Λανοτρόπιος on the Antikythera mechanism (T. Freeth, A. R. Jones, J. M. Steele, and Y. Bitsakis, "Calendars with Olympiad Display and Eclipse Prediction on the Antikythera Mechanism," *Nature* 454 [31 July 2008] 614–617, at 615, with Supplementary Information published online at 15–16).

[52] Trümpy, *Untersuchungen* 213.

[53] *Suda* γ 346, η 241; [Zonar.] *Lex.* I 987.9; Pletho *Nomoi* 1.21 (M. V. Anastos, "Pletho's Calendar and Liturgy," *DOP* 4 [1948] 183–305, at 188–189).

[54] Gibbs, *Greek and Roman Sundials* 123, no. 1001.

[55] Gibbs, *Greek and Roman Sundials* 189, no. 1072G.

[56] H. Diels, *Antike Technik: Sieben Vorträge*[2] (Leipzig/Berlin 1920) 181, with 180 Abb. 58 = Gibbs, *Greek and Roman Sundials* 324, no. 4001G.

Obviously, this has no bearing on the localization of Ortygia and, consequently, Syrie, since both the instruments (more frequently) and the label (less frequently) are often found in antiquity. It merely indicates the connection between this type of *heliotropion* (the sundial) and the seasonal "turnings."

Finally, the name of the homonymous plant and stone *heliotropion* was explicated with reference to either the diurnal or the annual solar movement. The earliest preserved interpretation, that of Theophrastos, associated it indirectly with the latter. He claimed that the plant *heliotropion* flowers with respect to the solstices (*Hist.pl.* 7.15.1), which was repeated by Isidore (*Etym.* 17.9.37). On the other hand, a number of authors interpreted the name of the plant with reference to the diurnal solar motion.[57] Thus the majority of interpretations of the plant's and the stone's name associate it with the diurnal solar movement, even though the earliest associates it indirectly with the annual.

These sporadic occurrences of the variants of the phrase in general support the primary meaning of the "turnings of the sun" inherent in all the examples adduced above, but additionally show that the phrase could also designate the characteristic moments in the diurnal solar movement.

"Syr-," "Ortygia," and "the turnings of the sun"

Thus far three complexes composed of similar elements have been recognized:

(1) the island of Syrie "above" Ortygia where occur "the τροπαὶ ἠελίοιο"

(2) an island in the Kyklades named Syros with a *heliotropion* (or two *heliotropia*: the cave and Pherekydes' instrument), not far from the island of Delos, regularly called—along with

[57] Varro *Rust.* 46; Plin. *HN* 18.252, 22.57; Plut. fr.101 Sandbach (schol. Hes. *Op.* 765–768); Isid. *Etym.* 17.9.37; Diosc. *De mat. med.* 4.190; Procl. *De sacrif.* (148.10–12, 14–16 Bidez; R. M. Van den Berg, *Proclus' Hymns* [Leiden 2001] 20, 80); *Myth.Vat.* 3.8.9 (204.34–40 Bode), where it is added that the homonymous stone received its name with reference to the diurnal solar movement.

nearby Rheneia—Ortygia[58]
(3) a *heliotropion* at Syracuse, a Sicilian city founded on an offshore islet named Ortygia[59]

At first glance, these three combinations seem related; however, one must bear in mind the provisional nature of the connection of *heliotropia* known from the historical period with the mythic and earlier historical occurrences that preceded them.[60] The collocation of these two toponyms and their association with solar turnings undoubtedly indicates a certain coherence in the creation of these combinations, yet no underlying common regularity can be recognized in their formation, other than their postulated, often undatable, association with the annual solar movement.

Scholars have certainly tried to establish a connection between some of these 'triplets'. It seems that the earliest attempts at this date from the Hellenistic period. Thus Lorimer argued that Eratosthenes, identifying Homeric Ortygia with the Sicilian,[61] further identified Syrie with Syracuse.[62] This is tentative,

[58] Pind. *Pai.* VIIb.48 S.-M.; Call. *Hymn.Ap.* 58–59 with schol., and *Aet.* fr.18.7 Pf.; Ap. Rhod. 1.419, 537, 4.1704; Lycoph. 401–402 with paraph. Rec. (398 Leone); Nikander *FGrHist* 271–272 F 5 (schol. Ap. Rhod. 1.419 [38 Wendel]); schol. EV *Od.* 5.123 (I 256 Dindorf); schol. BHQ *Od.* 15.404 (II 617 D.); schol. Pind. *Pyth.* hypoth. a, *Nem.* 1.4a, c; schol. Ap. Rhod. 1.308a (35 W.), 419 (38–39 W.); schol. (Tzetz.) Lycoph. 401 (II 149–150 Scheer); Strab. 10.5.5; Verg. *Aen.* 3.124; etc.

[59] Hes. fr.150.26 M.-W.; Pind. *Nem.* 1.1–4, *Ol.* 6.92, *Pyth.* 2.6; Timaios *FGrHist* 566 F 164 (Diod. 5.3.5); Eratosth. IB3, fr.6 Roller (Strab. 1.2.14); Hermesianax fr.7.72 Powell; schol. Pind. *Ol.* 6.156a, c, 158b; *Pyth.* 2.6c, 10, 12a, 3.120a, 122; *Nem.* 1.inscr. b, 1a, b, 2a, b, 3, 4a, c, e, g; Strab. 6.2.4; Verg. *Aen.* 3.692–696; etc.

[60] Another pairing of Syrie with Ortygia is attested at Ephesos, where an offshore island named Syrie was joined to the mainland (Plin. *HN* 2.204, 5.115). The ancient name of Ephesos was Ortygia: *HN* 5.115; Steph. Byz. s.v. Ἔφεσος; Herodian. 3.1 (*GG* III.1 289.30–31); Eust. Dionys. Per. 823 (*GGM* II 362); cf. Tac. *Ann.* 3.61 and schol. Pind. *Nem.* 1.inscr. b (Aristonikos), 2b for an Ortygia at Ephesos; Prop. 3.22.15 is noncommittal. This pair, however, is not associated with the solstices.

[61] IB3, fr.6 Roller (Strab. 1.2.14). Ortygia was perhaps associated with

but I cannot think of a better candidate for Eratosthenes' Syracusan Ortygia than the island of that name in the fifteenth book of the *Odyssey*. Furthermore, it is possible that whoever contrived the Pythian oracle[63] cited by Pausanias (5.7.3) with respect to the foundation of Syracuse, where an Ortygia "above Thrinakie" (Θρινακίης καθύπερθεν) is mentioned, clearly with Homer's Syrie "above Ortygia" (Ὀρτυγίης καθύπερθεν) in mind,[64] also identified Homeric toponyms with the Sicilian ones. Modern scholars, especially German, followed suit. Thus, for example, some identified Ortygia with Syracuse,[65] while others argued for the identity of Syracuse and Syrie.[66] Finally, Syrie and Ortygia were identified with the island of Pentellaria (or Malta) and Syracuse, respectively.[67] Since Syracuse was founded ca. 733 B.C.,[68] it cannot be much, if at all, later than the *Odyssey*.[69] Thus chronology cannot solve

Sicily already by Hesiod (fr.150.25–27 M.-W.; Ballabriga, *Le Soleil* 23, and *Les fictions d'Homère* 99). Both testimonies probably belong to a general tendency to identify Odysseus' wanderings with locations in Magna Graecia.

[62] Lorimer, *Homer* 81.

[63] Fontenrose Q(uasi-Historical response) 27: J. Fontenrose, *The Delphic Oracle. Its Responses and Operations* (Berkeley 1978) 138–139, 278.

[64] Ballabriga, *Le Soleil* 23–24, cf. *Les fictions d'Homère* 103–106.

[65] K. H. W. Völcker, *Über homerische Geographie und Weltkunde* (Hannover 1830) 24; H. Berger, *Mythische Kosmographie der Griechen* (Leipzig 1904) 9; J. Wackernagel, *Sprachliche Untersuchungen zu Homer* (Göttingen 1916) 248; Ballabriga, *Les fictions d'Homère* 99, 106; M. L. West, *The Making of the Odyssey* (Oxford 2014) 84.

[66] Wackernagel, *Sprachliche Untersuchungen* 248–249; Ballabriga, *Les fictions d'Homère* 100, 102–103, 106, 118; West, *The Making of the Odyssey* 84.

[67] W. Dörpfeld, *Homers Odyssee* I (Munich 1925) 241.

[68] T. J. Dunbabin, *The Western Greeks* (Oxford 1948) 13–17, 48–52, 435–438, 442–450; A. J. Graham, "The Colonial Expansion of Greece," *CAH* III.3 (1982) 83–162, at 105–106, 162, and *Collected Papers on Greek Colonization* (Leiden 2001 [1988]) 162.

[69] For the question of the dates of Homer or the author of the *Odyssey* see e.g. R. Janko, *Homer, Hesiod and the Hymns* (Cambridge 1982) 228–231 (743–713 B.C.); B. Powell, *Homer and the Origin of the Greek Alphabet* (Cambridge

the problem whether Homer derived his description from the existing geographical reality or, rather unlikely, the locations from the *Odyssey* influenced the naming of these toponyms.[70] Also, the connection with Dionysios' *heliotropion*, sometimes adduced as an argument for the connection of Syracuse with Syrie, cannot be taken for granted, since nothing actually suggests a link between the instrument, most probably a sundial or a solstice-marking stele such as the contemporaneous example at Itanos, and the Sicilian localization of Homeric toponyms.

Syrie, Ortygia and "the turnings of the sun": the diurnal solar movement

More generally, Homeric Syrie has been looked for in the west. However, this suggestion is not substantiated by convincing arguments, although it was popular already in antiquity, when it was as a rule associated with the diurnal solar movement. A scholiast on Homer thus explained the position of Ortygia/Syrie "as it were toward the turnings of the sun, which is in the westward direction."[71] In this way Aristarchos and Herodian of Alexandria, whose opinions the scholiast cites, took *tropai* simply to mean a "setting." Likewise, Hesychios explained the Homeric phrase as referring to the place "where the settings commence," which similarly points to the west, although it is not easy to determine its exact meaning.[72] Modern

1991) 219–220 (ca. 800–750); West, *The Making of the Odyssey* 1, 22, 27, 37–38, 40–41, 43 (after 630).

[70] For West, who argues for an extremely late date for the *Odyssey*, chronology is no obstacle and he freely derives the toponyms in the *Odyssey* from the Sicilian ones (*The Making of the Odyssey* 84). Others believe that the localities in the *Odyssey* were only subsequently identified with the western Mediterranean toponyms (e.g. J. S. Romm, *The Edges of the Earth in Ancient Thought* [Princeton 1992] 184–185).

[71] Schol. BHQ *Od.* 15.404 (II 617 Dindorf); cf. Eust. *Od.* 15.404 (II 105 Stallbaum).

[72] Hsch. o 1339; cf. Heath, *Aristarchus* 10 n.1, citing Martin, *Mémoires de l'Académie des Inscriptions et Belles-Lettres* 19.2 (1879), who argued that Hesychios had the summer solstice setting in mind. In this case it would not belong to the group of the diurnal solar movement associations. Ballabriga, *Le Soleil* 20–21, on the other hand, believed that it refers to the meridian

scholars, once again, followed suit, associating the phrase with the sunset turning-point in the far west.[73] It was further claimed that Hesiod understood Homer's *tropai* as the place of sunset, and tried to correct it to what he believed was the right usage of the term, in the meaning of "solstice."[74] Dicks implicitly associated the phrase with the diurnal solar movement, although he is noncommittal whether it refers to the east or the west.[75] Lorimer, on the other hand, believed that the "turnings" refer to the end of the sun's nocturnal voyage, that is, its risings in the east, identifying Syrie with Syria.[76] The fact that Eos carried Kephalos off ἐν Συρίᾳ ([Apollod.] *Bibl.* 3.14.3), adduced in support of this thesis, could indeed strengthen it, associating Syria with the abode of Eos, but this "Syria" could just as well be a rationalization of a pure mythic concept of Syrie.

There is another theory connecting the "turnings of the sun" with the diurnal solar motion. Ballabriga, following Eustathios, places the meridian passage of the sun vertically above Ortygia, associating the phrase the "turnings of the sun" with this con-

passage of the sun, after which the setting actually commences, if we agree with Strabo (probably also Posidonios fr.49 E.-K.), who calls the segment of the sun's voyage from the meridian to the point of setting a δύσις (2.3.8; cf. Achil. *Isag.* 35 and schol. MQDΔKVUAS Arat. *Phaen.* 62); but this does not seem to be the true solution to the problem (see below), although it could be supported by a similar explanation of Eustathios (*Od.* 15.404 [II 105 Stallbaum]), who associated the *tropai* with προτρέπω of *Od.* 11.18 (cf. 12.381), describing the sun's decline from the zenith (Lorimer, *Homer* 81).

[73] Heath, *Aristarchus* 9–10; Dörpfeld, *Homers Odyssee* I 241 (the sun turning south and continuing along the southern coast of Libya to its eastern point of rising); Dicks, *Early Greek Astronomy* 31; LSJ s.v. τροπή I.a; apparently also Wenskus, *Astronomische Zeitangaben* 39.

[74] W. F. Wyatt Jr., "Short Accusative Plurals in Greek," *TAPA* 97 (1966) 617–643, at 628 n.18.

[75] Dicks, *Early Greek Astronomy* 32–33.

[76] Lorimer, *Homer* 80, 82–84 (further cited by G. L. Huxley, "Homerica," *GRBS* 3 [1960] 17–30, at 17–18; Kirk, Raven, and Schofield, *The Presocratic Philosophers* 55 n.2; Ballabriga, *Le Soleil* 19 n.39; E. L. Brown, "Eumaeus' Native Isle," *CJ* 80 [1985] 292–296, at 293–294).

cept.[77] Others have also argued for the meridian passage of the sun as the origin of the phrase.[78] This interpretation, although more plausible than the one arguing for the farthest west, still associates the phrase with the diurnal passage of the sun, which is, I will argue below, less plausible than the alternative (the annual solar movement).

Lastly, Nakassis claims that the use of προτραποίμην in *Od.* 12.381 indicates the association of the "turnings" with the horizon,[79] even though it is clear from *Od.* 12.379–381 and 11.17–18 that here the poet speaks of the meridian passage of the sun, contrasting its ascent and descent.[80]

The chariot-race model: the diurnal and annual solar movement

Additionally, Homer's postulated notion of the sun's diurnal path—including its turnings—was compared to a chariot race, the starting point being the east, the extreme western point being compared to a *nyssa*, or turning-post, whence the sun began the return voyage.[81] This chariot-race metaphor was applied already in antiquity to both the diurnal and the annual solar movement, and deserves a short digression, limited to the examples that refer to the sun's actual turnings. Thus Manilius mentioned a *meta* of the sun in Cancer (*Astron.* 4.162), which was also known to Germanicus (*Arat.* 481),[82] together with

[77] Ballabriga, *Le Soleil* 21. Cf. Wenskus, *Astronomische Zeitangaben* 39 n.107, who is critical; Ballabriga himself later rejected his earlier interpretation: *Les fictions d'Homère* 108 n.2.

[78] Brown, *CJ* 80 (1985) 294.

[79] D. Nakassis, "Gemination at the Horizons: East and West in the Mythical Geography of Archaic Greek Epic," *TAPA* 134 (2004) 215–233, at 226 n. 49.

[80] Cf. Lorimer, *Homer* 81; Ballabriga, *Le Soleil* 21. In both passages Homer indeed uses the combination of τρεπ- with Helios in order to designate the diurnal aspect of solar movement, although not with respect to its risings and settings.

[81] W. W. Merry, J. Riddell, and D. B. Monro, *Homer's Odyssey* I (Oxford 1886) 407 *ad* 10.81.

[82] In *Anth.Gr.* 9.384.13 the sun passes into or through (μετανίσσεται)

another in Capricorn (German. *Arat.* 7, 289, 483). Likewise, Julian the Apostate described the sun's turning (τρέπω) as around a *nyssa* in Capricorn (*Or.* 4, 156a [202 Hertlein]), while Manilius in general described the motion of the sun's chariot between its turning points in the aether (*aethere metae*).[83] These examples refer to the annual solar movement. On the other hand, it seems that Avienius used the term *meta* in the context of its diurnal movement, describing the sun's turning towards the north at the end of its daily voyage (*Or.marit.* 667). Similarly, Cassiodorus compared the circuits of *quadrigae* around the *metae* to the course of the sun (*Var.* 3.51.7), most probably with reference to its diurnal path, while Orosius compared the eastern and western extremities of the *oikoumene*, bounded by the Ocean, with the (diurnal) "turning points" (*metae*), which is a concept appropriated from the terminology of solar movement expressed in terms of the chariot-race metaphor (*Hist.* 3.19.1; 3.20.1, 3, 8).

Nonnos used the word *nyssa* more than any other ancient author, and, moreover, he employed it in several different contexts. The *nyssa* bathed by Okeanos is probably to be associated with his circling path, rather than Helios', although one could argue that it must be situated in the extreme west and/or east (*Dion.* 38.109, cf. 1.497). This could be corroborated with Nonnos' use of the word to indicate the western (38.364), eastern (1.169–170), or both (1.205) diurnal "turning-points" of the sun. Moreover, it could also assume the meaning, it seems, of a day-time meridian passage/turning/culmination of the sun, i.e. noon (*Paraphrasis S. Evang. Joan.* 4.30, 240–241). The *nyssa* of Book 38, on the other hand, could mean either the western setting or the boundary of the zodiac, i.e. one of the

Cancer, which could be a reference to its turning, as well as to the chariot-metaphor. Cf. *Il.* 16.779 and *Od.* 9.58, where the poet describes the meridian "turning" of the sun also using the verb μετανίσσομαι.

[83] *Astron.* 1.198–199; if not for 4.162, it would be possible to interpret this example as the diurnal "turnings" of the sun.

tropics (38.259). The annual "turning-points" of the sun are surely meant when the "watery" (δροσερά) *nyssa* is associated with Selene and her cattle (1.454), which should designate Cancer;[84] the "higher" (ὑψιτενής) *nyssa* in Cancer also designates the summer solstice (38.284–285),[85] while the "lower" (χθαμαλή) *nyssa* in Capricorn designates the winter solstice (38.277–279), as does the "not-stormy" (ἀχείμων) *nyssa* (3.35). Furthermore, the *nyssa* of the zodiac, beyond which Phaethon is taken in his father's chariot, outside the limit of its ancient road, surely refers to one of the tropics (38.327). Thus Nonnos indiscriminately used the term to designate the extreme points both in the diurnal and in the annual path of the sun.[86]

Some earlier Greek authors similarly, if more ambiguously, associated the extreme points in the annual solar movements with chariot racing. Thus it is possible that Theodektas' ἀγχιτέρμων[87] actually refers to the sun's chariot nearing the "borders" of its annual path, rather than the borders of the Ethiopians. Although this is only a conjecture, the use of the word τέρμα suggests that the tragedian might have had this concept in mind.[88] His near contemporary Archestratos men-

[84] According to 6.236–237.

[85] The Βορειάς *nyssa* beside (ἐγγύθι) which the Bears move (38.406–407) can also be associated with this *nyssa*. A *nyssa* "higher" than the Okeanos by (παρά) which the Bears move (25.398), on the other hand, probably designates the point of their lower culmination, since its position allows the constellations to remain circumpolar (cf. Johann. Gaz. *Ecphras.* 1.188–189). In Plut. *Ad princip. inerud.* 782D–E the sun (presumably about the summer solstice) advances to the north and reaches its "greatest elevation" (ὕψωμα μέγιστον); as Plutarch adds that it then moves the slowest, it is probable that he had in mind its azimuthal movement, rather than its meridional height.

[86] He also uses the word in other contexts, which are of no interest here. For a discussion on the word *nyssa* in Nonnos, which somewhat differs from the above, see V. Stegemann, *Astrologie und Universalgeschichte. Studien und Interpretationen zu den Dionysiaka des Nonnos von Panopolis* (Leipzig 1930) 30, 34.

[87] *TrGF* I 72 F 17 (Onesikritos *FGrHist* 134 F 22 [Strab. 15.1.24]). The tragedian flourished in the second quarter of the fourth century.

[88] See Herakleitos 22 B 120 D.-K.; for the interpretation of the fragment

tions the sun chariot's outermost orbit (πυμάτη ἀψίς) in the summer, presumably at the solstice.[89]

Therefore, the chariot-racing model was used to describe various phenomena, including both diurnal (risings/settings and meridian passage) and annual solar movement. It thus belongs to the complex of Greek notions concerning the spatial aspect of the solstices.[90]

Syrie, Ortygia and "the turnings of the sun": the annual solar movement

I have already suggested that the interpretation of *tropai* as diurnal turnings of the sun is most probably incorrect. It has been claimed that "this sense of *tropai* is absolutely unparalleled and highly improbable."[91] My discussion at the beginning of this paper on the earliest attestations of the phrase, including that in the *Odyssey*, agrees with and supports the first part of this conclusion. Concerning the second, the improbability shows itself most clearly in the fact that, according to this interpretation, the sun would have to move eastward following the turn.[92]

as referring to the limits of the sun's annual movement see M. L. West, *Early Greek Philosophy and the Orient* (Oxford 1971) 157–158; Bilić, *TAPA* 142 (2012) 311–313, 323. τέρμα/τέρματα has a double meaning: "turning post" or "point," but also "boundary," "endpoint," "*terminus*" (Kahn, *The Art and Thought of Heraclitus* 51, 161; A. C. Purves, *Space and Time in Ancient Greek Narrative* [Cambridge 2010] 56 with n.88). In Johann. Gaz. *Ecphras*. 2.199–200 τέρμα and νύσσα are synonyms for the western diurnal turning-point of the sun, while in 1 Clem 5:7 the τέρμα τῆς δύσεως refers to the same location.

[89] Fr.33.1–2 Brandt = *Suppl.Hell.* 164.1–2.

[90] For a ceremonial chariot race in India—perhaps held at the winter solstice—in which the sun was "won" see F. B. J. Kuiper, *Ancient Indian Cosmogony* (New Delhi 1983[1960]) 154–155; M. Sparreboom, *Chariots in the Veda* (Leiden 1985) 15; A. Parpola, "The Nāsatyas, the Chariot and Proto-Aryan Religion," *Journal of Indological Studies* 16–17 (2004–2005) 1–63, at 42. Parpola further argues (42 n.262) for the important role of a "solar" turning-post in the ritual; however, this is only a speculative suggestion, unsupported, so far as I can tell, by the evidence from the sources.

[91] Kirk, Raven, and Schofield, *The Presocratic Philosophers* 55.

[92] Merry, Riddell, and Monro, *Homer's Odyssey* I 407 *ad* 10.81, were well aware of this absurdity. However, this qualification only applies if the sun

It is claimed that even though "Homer is generally vague and inconsistent about geographical and directional detail, … he very seldom talks what the common man would regard as positive nonsense."[93] The sun moving eastwards over the sky certainly qualifies as such nonsense. Here, if anywhere, one should cautiously apply the principle of charity, rather than to ascribe the paradoxical to an inherent incoherence of a system being discussed.[94] The application of this principle does not mean that every instance of incoherence or irrationality should be effaced from the analyzed text, but rather that one should approach its interpretation with a presupposition that it is coherent and rational.[95] An interpretation that arrives at the conclusion that Homer believed in an eastward movement of the sun across the sky does not seem very convincing in this light. That does not mean it is completely out of the question, but that a plausible interpretation preserving the text's coherence, if one is available, should be preferred. Additionally, both the phrase and the chariot-race metaphor suggest that the sun would be visible after the turn, which is only applicable if the "turning" is an annual one.

Some scholars have indeed understood in the "turnings of the sun" a reference to the annual solar motion, associating Syrie/Ortygia with the annual solar turnings.[96] Yet different

was understood to travel the same way back, which is implied by both the phrase and the chariot-race metaphor, and is obviously contrary to experience; if it was imagined, for example, to travel over the Ocean via the north, or perhaps underground, or on the outside of an opaque celestial vault, to the place of its rising, the interpretation would not be absurd at all.

[93] D. Page, *Folktales in Homer's Odyssey* (Cambridge 1973) 44.

[94] G. E. R. Lloyd, *Demystifying Mentalities* (Cambridge 1990) 18.

[95] *Pace* H. S. Versnel, *Inconsistencies in Greek and Roman Religion* I *Ter Unus. Isis, Dionysos, Hermes* (Leiden 1990) 14, who criticizes attempts to find coherence in particular texts or systems that reveal internal contradictions or inconsistencies. For a cautiously charitable approach to the interpretation of Greek myth see R. Buxton, *Forms of Astonishment: Greek Myths of Metamorphosis* (Oxford 2009) 58–61, 250–251.

[96] Nilsson, *Primitive Time-reckoning* 316; Heidel, *The Frame* 59; West, *Early*

authors have opted for different points in the annual solar orbit. Thus some selected the extreme west,[97] or rather the extreme northwestern point the sun reaches at the summer solstice sunset,[98] or the extreme southwestern point the sun reaches at the winter solstice sunset.[99] Others, on the other hand, claim that the "turnings of the sun" designate the sunrise point on the eastern horizon on the day of the summer or winter solstice,[100] identifying Syrie with Syria and associating Ortygia with the abode of Eos described in the *Odyssey*.[101] Finally, some have believed that Ortygia should be looked for in Aia-Kolchis, the dwelling-place of Eos (*Od.* 12.3–4), believing that the "turnings of the sun" designate the place of sunrise at the horizon on the day of the summer solstice,[102] while others have searched for Syrie around Sinope, positioned towards the summer solstice sunrise as observed from Greece, where the Leukosyrians/Syrians/Assyrians used to dwell.[103]

Thus another 'triplet' is formed of Syrie/Syria, Ortygia-the-abode-of-Eos, and the "turnings of the sun," pointing towards the east. Although this line of interpretation considers the annual motion of the sun rather than the diurnal, there seems to

Greek Philosophy 98, and *Hesiod: Works and Days* (Oxford 1978) 291–292 (noncommittal as to whether east or west, summer or winter were meant).

[97] Völcker, *Über homerische Geographie* 24 (noncommittal as to the summer or winter solstice).

[98] Martin, in Dar.-Sag. I.1 (1892) 477a; Wackernagel, *Sprachliche Untersuchungen* 247–248; Ballabriga, *Les fictions d'Homère* 108–109.

[99] Berger, *Mythische Kosmographie* 8–9.

[100] A. Hoekstra, in A. Heubeck and A. Hoekstra (eds.), *A Commentary on Homer's Odyssey* II (Oxford 1989), 257; H. Hunger and D. Pingree, *Astral Sciences in Mesopotamia* (Leiden 1999) 76–77.

[101] *Od.* 5.121–124; Hoekstra, in *A Commentary on Homer's Odyssey* II 257. Hoekstra accordingly chooses the midwinter sunrise (cf. A. Hoekstra, "Hésiode et la tradition orale. Contribution à l'étude du style formulaire," *Mnemosyne* 10 [1957] 193–225, at 218, erroneously cited at *Commentary* 257).

[102] Kirk, Raven, and Schofield, *The Presocratic Philosophers* 55–56 n.3.

[103] Huxley, *GRBS* 3 (1960) 18–23, esp. 20.

be no compelling reason to identify Syrie with Syria rather than Syros or Syracuse, and the absence of any identifiable Ortygia in the Levant, countered by the existence of Ortygias both in the Kyklades and on Sicily, seems to speak against this theory. Moreover, there seems to be absolutely no reason for preferring, for example, the midwinter over the midsummer rising of the sun, except for the convenient fact that it points towards Syria rather than Asia Minor, as does the midsummer rising. Finally, no matter how vague the knowledge of the Levant that originated in the Mycenaean period became over time,[104] it probably did not decay so radically as to believe that Syria is an island.[105]

It has also been suggested that Delos (here apparently identified with Ortygia) lies in the direction of the winter solstice sunrise when observed from Syros, which explains the Homeric description.[106] When observed from the northernmost part of Syros the sun at the winter solstice indeed rose almost aligned with the southernmost tip of the neighboring island of Rheneia (azimuth 120°13′ in 700 B.C.). Furthermore, Rheneia was occasionally identified with Ortygia,[107] which supports this interpretation, but it demands that the turning-places of the sun be located at Ortygia, defining the direction from a point of observation in the west (i.e. Syros), although Syrie is located "beyond" Ortygia only if looking from the east.[108] In this case Homer's description would be formulated somewhat awkwardly: "Syrie is to the west of Ortygia; the latter lies in the direction of winter sunrise when observed from the former."

In the end, all these interpretations take into consideration

[104] Hoekstra, in *A Commentary on Homer's Odyssey* II 257.

[105] Cf. Huxley, *GRBS* 3 (1960) 17; Kirk, Raven, and Schofield, *The Presocratic Philosophers* 55.

[106] D. Pingree, in Wenskus, *Astronomische Zeitangaben* 39 n.107.

[107] Strab. 10.5.5, probably also *Hymn.Hom.Ap.* 15–16 (cf. *Hymn.Orph.* 35.4–5); Ballabriga, *Le Soleil* 16–17.

[108] Lorimer, *Homer* 81 n.1; Ballabriga, *Le Soleil* 17–18.

the spatial level of manifestation of the solstices defined by the extreme azimuths of solar risings and settings. There is, however, another way of looking at this problem, and I will argue that this line of interpretation originated with Pytheas.

Mesopotamian "turnings"

Before proceeding to my final argument, some remarks on the concept as recognized in contemporary Mesopotamia are pertinent to the subject, since Hunger and Pingree associated the notion in the ^{mul}Apin (II.i.9–24), where the solar year is defined by the solstices, with the Homeric "turnings of the sun."[109] In their turn, the solstices in the ^{mul}Apin are defined by the position of the sun at the eastern horizon and the change in the direction of the position of successive sunrises.[110] The word used in these texts is GUR (*târu*), "to turn (around),"[111] which probably means that it refers to the "turnings" at the horizon, since the usual term used to designate a solstice in Akkadian is *šamáš* GUB (*izziz(a)*), where GUB (*uzuzzu*) means "to stand."[112] Furthermore, in *Enuma Eliš* (7.127) there appears a term KUN.SAG.GI (Akk. *rēš-arkat*), literally meaning "front-back,"[113]

[109] Hunger and Pingree, *Astral Sciences* 75–77.

[110] II.i.11–12, 17–18, ii.3 (H. Hunger and D. Pingree, *MUL.APIN: An Astronomical Compendium in Cuneiform* [Horn 1989] 72–73, 75, 92).

[111] *CAD* 18 256–257 s.v. *târu* 3.a.1′.

[112] F. Rochberg, "Babylonian Horoscopes," *TAPhS* 88.1 (1998) 43, 157, and *In the Path of the Moon. Babylonian Celestial Divination and its Legacy* (Leiden/Boston 2010) 194–196; cf. F. Gössmann, *Planetarium Babylonicum, oder die sumerisch-babylonischen Stern-Namen* (Rome 1950) 184, no. 373. This tradition was transmitted from Mesopotamia to India. Thus in *Kausītakibrāhmana* 19.3 (first half of the first millennium B.C.) the sun is described resting, standing still, and turning to the north or south (Hunger and Pingree, *Astral sciences* 76), but without any explicit reference to the horizon as the location of these turnings.

[113] *CAD* 14 285–288 s.v. *rēšu* 4, 1.2 274–276 s.v. *arkatu* 1; B. Landesberg and J. V. Kinnier Wilson, "The Fifth Tablet of Enuma Eliš," *JNES* 20 (1961) 154–179, at 173; cf. A. Deimel, *Enuma Eliš, sive Epos Babylonicum de Creatione Mundi* (Rome 1912) 58.

but occasionally translated "turnings,"[114] "turning point,"[115] or "*Wendepunkt*/solstitial point/*Sonnenwende*."[116] This translation seems plausible, but because of the largely unresolved problem of the identity of the associated concept of *nēberu*,[117] it is not possible to discuss it further. Since the mulApin are dated to ca. 1000 B.C., their date is relatively close to that of the *Odyssey*,[118] making it possible that the concept known to the authors of the mulApin at least in some general way influenced Homer, and that the Greeks could have taken over this concept from Mesopotamia together with a number of other Mesopotamian ideas they adopted during this period.[119] However, since the

[114] Speiser in *ANET*2 72; in *ANET*3 72, however, Speiser offered a different translation.

[115] W. Horowitz, *Mesopotamian Cosmic Geography* (Winona Lake 1998) 115.

[116] W. von Soden, "Neue Bruchstücke zur sechsten und siebenten Tafel des Weltschöpfungsepos Enuma elish," *ZA* 47 (1942) 1–26, at 17; A. Heidel, *Gilgamesh Epic and Old Testament Parallels*2 (Chicago 1942) 59; F. M. T. Böhl, "Die 50 Namen des Marduk," in *Opera minora: studies en bijdragen op assyriologisch en oudtestamentisch terrein* (Groningen/Djakarta 1953) 282–312, at 306. *kunsaggû*, the Akkadian loan-word, is rendered as "turning point" based on the equation KUN.SAG.GA = *muḫru*, a mark of "the turning point of a processional circuit" (*CAD* 10.2 177 s.v. *muḫru* 2, cf. 8 542 s.v. *kunsangû*; Horowitz, *Mesopotamian Cosmic Geography* 115 n.12).

[117] See Böhl, in *Opera minora* 303–307; Landesberg and Kinnier Wilson, *JNES* 20 (1961) 172–174.

[118] For example, the source HH = VAT 9412+11279 was copied in 687 or 686 B.C. (Hunger and Pingree, *MUL.APIN* 7, 10–12).

[119] See e.g. W. Burkert, "Oriental and Greek Mythology: The Meeting of Parallels," in J. Bremmer (ed.), *Interpretations of Greek Mythology* (London 1988) 10–40, *The Orientalizing Revolution: Near Eastern Influence on Greek Culture in the Early Archaic Age* (Cambridge [Mass.] 1992), and *Babylon Memphis Persepolis: Eastern Contexts of Greek Culture* (Cambridge [Mass.] 2004); West, *Early Greek Philosophy*, and *The East Face of Helicon: West Asiatic Elements in Greek Poetry and Myth* (Oxford 1997); C. Penglase, *Greek Myths and Mesopotamia: Parallels and Influence in the Homeric Hymns and Hesiod* (London/New York 1994); J. Bremmer, *Greek Religion and Culture, the Bible and the Ancient Near East* (Leiden/Boston 2008); B. Louden, *Homer's Odyssey and the Near East* (Cambridge 2011).

Mesopotamian concept is apparently defined by the position of the sun at the eastern horizon, I do not see it as parallel to the concept of the "turnings of the sun" in the *Odyssey*. It could be, on the other hand, directly associated with the *heliotropia* in Syracuse, Athens, Itanos, and on Syros.

Pytheas' solstice island

I have pointed out in the introduction that the island of Thoule was located from the time of Pytheas onwards with respect to the concept of the "turnings of the sun," and could rightly be called the island of the solstice. Moreover, Pytheas' report suggests that in his account he combined the actual voyage to whatever place in the far north he had visited with a specific Homeric reference.[120] A solstice island situated six days' sail to the north of Britain[121] conforms well to the account in the *Odyssey* where Aiolos' floating island is situated a six days' sail from the Laistrygonian Telepylos (10.80–81), described as a place where the paths of night and day are close together (10.86). This Homeric line was interpreted by both ancients, apparently including Pytheas, and moderns as a reference to the fixed (geographical) arctic circle.[122] This would provide a direct link with the solstice island of Syrie, but it must be kept in mind that the Homeric description could only refer to a flat earth, and thus could only provisionally correspond to Pytheas'

[120] Bilić, *TAPA* 142 (2012) 319–321; cf. Ballabriga, *Les fictions d'Homère* 128, for Pytheas' knowledge of the poetic lore on meteorological conditions in the far north.

[121] Pyth. fr.6a Mette = fr.2 Roseman; fr.13a Mette = T 18a Roseman. Cf. Timaios *FGrHist* 566 F 74 = Pyth. fr.11b Mette = T 23 Roseman (K. Müllenhoff, *Deutsche Altertumskunde* I [Berlin 1870] 385, 472; Thomson, *History* 146 n.1; M. Cary and E. H. Warmington, *The Ancient Explorers*[2] [Baltimore 1963] 256 n.47; S. Bianchetti, *Pitea di Massalia: L'Oceano* [Pisa 1998] 147, 173; D. W. Roller, *Through the Pillars of Herakles* [New York/London 2006] 72, 73 n.139).

[122] Bilić, *TAPA* 142 (2012) 308–310, 313, 322–323; cf. Ballabriga, *Les fictions d'Homère* 122–124 (he further places this particular interpretation in the context of archaic thought, 125–132).

notion. Although Homer's text does not associate Syrie with the land of the Laistrygonians,[123] the two pieces of mytho-geographical lore associated with these two locations seem to belong to a similar tradition concerned with the meteorological conditions obtaining in the far north, more precisely, at what would later be understood as the fixed arctic circle defined by the annual solar movement, but what Homer would only recognize as the sun's northernmost reach.[124] Hence Syrie should be located with respect to this fact, i.e. the turnings of the sun in the *Odyssey* are to be interpreted as the place where the sun "turns" in the north when it reaches the northernmost point in its annual voyage, most probably—expressed in terms belonging to a frame of reference that would only be created much later—at the latitude of 54°.[125] The sun is thus believed to be "visiting" a certain location at its turning, which is similar to the notions expressed by Hesiod, Herodotos, and the Hippocratic author adduced above (197 ff.). This concept is less specific than the observation of extreme solar azimuths, although it incorporates the notion of soltitial horizon-points as one of its defining characteristics. The "location" of Syrie is thus a specific geographical latitude defined by the annual solar movement.

It seems conceivable that Pytheas combined his geographical explorations with what seems to be an intriguing example of Homeric scholarship. His solstice island, described in scientific

[123] Interestingly, Delos/Ortygia, to which Syrie is intimately connected, was a floating island, thus corresponding to Aiolos': Pind. fr.33d S.-M. (Strab. 10.5.2); schol. HM *Od.* 10.3 (cf. *Anecd.Par.* III 464.7; Eust. *Od.* 10.3 [1.363 Stallbaum]; Plut. *De fac.* 923C; Sen. *Q.Nat.* 6.26.2); Favorin. *De exil.* fr.96.25.2 Barigazzi; Callim. *Hymn.Del.* 35–54; Arrian *FGrHist* 156 F 68 (Eust. Dionys. Per. 525 [*GGM* II 318]); Verg. *Aen.* 3.73–77; etc.

[124] Bilić, *TAPA* 142 (2012) 319. I believe it is clear I am not attempting to fabricate here some Homeric 'doctrine' from these two more or less incidental remarks (cf. Q. Skinner, "Meaning and Understanding in the History of Ideas," *History and Theory* 8 [1969] 3–53, at 7, 12), but simply to suggest that they both probably refer to the same phenomenon.

[125] See the discussion at 196 above for the choice of this latitude.

terms and with reference to a spherical earth—where the summer tropic and the always-visible circle become one, i.e. their respective declinations are identical—is thus comparable to Homer's mythic island "where are the turning-places of the sun." Both accounts are part of a single ethnographic context, and both refer to the same phenomenon, although in different terms, and with a different underlying cosmological outlook, illustrating the transformation of Greek understanding of the solstices through different periods.

Conclusion

It seems that the passage of the *Odyssey* connecting Syrie, Ortygia, and the "turnings of the sun" refers to a mythic solstice island located at the latitude corresponding to a projection of the maximum solar declination onto the earth's surface, subsequently understood as the latitude of the fixed (geographical) arctic circle. Thus it could be taken as generally identical in nature to Pytheas' Thoule. For Homer this projection represented only the northernmost point in the annual solar orbit over a flat earth, conceptualized as a latitude defined by the summer solstice solar azimuths, and it could not have been defined in such precise terms as those used by Pytheas in his account, who was well acquainted with the sphericity of the earth and its relation to the solar movement.[126] His notions on the solar phenomena in the far north were precise, accurate, and complete, while Homer's notions on the meteorological conditions obtaining in that region were more general and certainly more haphazard.

However, even though the arguments for a cosmological location of Syrie seem convincing, two strong geographical candidates for its localization have been suggested (Syracuse

[126] The only thing that the author of the *Odyssey* had to be aware of in order to define his concept of the "turnings" is the annual progress of the sun on the horizon and the meridian, with no need of any theoretical background to account for this phenomenon (cf. Dicks, *JHS* 86 [1966] 30-31; Kahn, *JHS* 90 [1970] 112).

and Syros). Nevertheless, neither of them can be related to the solstices in the manner discussed in this paper, although the "turnings of the sun" were sometimes associated with the diurnal solar movement, which could have supported the Syracusan localization. Still, this line of interpretation of the Homeric text was revealed to be inadequate.

Other examples of *heliotropia* discussed or mentioned in this paper can be classified into two groups:

(1) sundials (Delos, Syracuse?, cf. the definitions in the lexicographers) and

(2) solstice alignment devices (the cave on Syros, Pherekydes' device, Meton's instrument, Itanos stele).

Thus nearly all occurrences of the variants of the phrase support the interpretation of solar turnings as referring to the defining points in the annual solar motion. Moreover, both the Homeric account and the devices in group (2) refer to the spatial manifestation of the solstices. However, while the latter refer to the extreme azimuths of solar risings and settings, the former could be interpreted as a projection of the maximum solar declination onto the earth's surface.

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